

SECTION 15300

FIRE PROTECTION SYSTEM

PART 1 GENERAL

1.1 SUMMARY

- A. Scope
 - 1. Provide the fire protection system as shown or specified, complete with all accessories for a complete functioning system to meet the Building Code State of New York, Department of Energy (DOE), FM Global Property Loss Prevention Data Sheets, and NFPA requirements.
- B. Description Of Aboveground Systems And Equipment
 - 1. WET PIPE SYSTEM
 - a. Piping;
 - 1) TYPE BCS-FP (STD), BLACK CARBON STEEL - FIRE PROTECTION.
 - 2) Piping below bottom chord of truss shall be TYPE BCS-FP (STD), BLACK CARBON STEEL.
 - b. Valves: Special Service - Fire Protection Valves.
- C. Related Work Specified Under Other SECTIONS
 - 1. Division 15 Section – General Mechanical Requirements.
 - 2. Division 16 Section - Electrical Work.
 - 3. Division 16 Section - Fire Alarm Systems.

1.2 DEFINITIONS

- A. AHJ: Federal, State, or Local Authority having jurisdiction responsible for approving equipment, materials, installation, or procedure.
- B. AISI – American Iron and Steel Institute.
- C. ANSI/HI: American National Standards Institute and Hydraulic Institute.
- D. ANSI/ASME B31.1 - Power Piping.
- E. ANSI/ASME SEC 9 - Welded and Brazing Qualifications.
- F. ANSI/AWS D1.1 - Structural Welding Code.
- G. ANSI/NFPA 12 - Carbon Dioxide Extinguishing Systems.
- H. ANSI/NFPA 72 - Fire Alarm Code.

- I. ANSI/NFPA 70 - National Electric Code.
- J. ASME – American Society of Mechanical Engineers.
- K. AWS – American Welding Society.
- L. DOE – Department of Energy.
- M. FM - Factory Mutual Global.
- N. UL – Underwriter’s Laboratories.
- O. NFPA – National Fire Protection Association. Current version unless mandated by local authority having jurisdiction.
- P. NEC – National Electrical Code.
- Q. Hose Connection: Valve with threaded outlet matching fire hose coupling thread for attaching fire hose.
- R. Working Plans: Documents, including drawings, calculations, and material specifications prepared according to NFPA 13 and NFPA 14 for obtaining approval from OWNERS Underwriter and authorities having jurisdiction.
- S. Fishmouth Connection: Branch pipe end shaped to fit run pipe cross-section.

1.3 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: Provide fire protection work per the mandatory code requirements, standards of NFPA, and the requirements of the OWNERS Underwriter, except where more stringent requirements are indicated, as modified and supplemented by the CONTRACT DOCUMENTS.
 - 1. The NFPA requirements include the appendices and supplements.
 - 2. The provisions and recommendations of the NFPA constitute mandatory minimum requirements for work specified herein. No payment will be made by OWNER for extra charges for work added in order to comply with NFPA Standards and OWNER’S Underwriter requirements.
- B. Installer Qualifications: An installer with at least three-years experience, is licensed where required by authorities having jurisdiction, and who has designed and installed fire-protection piping similar to that indicated for this Project and obtained design approval and inspection approval from OWNERS Underwriter and authorities having jurisdiction.
- C. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer or NICET Level 3 or 4 Designer. Base calculations on results of fire-hydrant flow test.

- D. Design Engineer Qualifications: A professional engineer or NICET Level 3 designer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of fire-protection piping that are similar to those indicated for this Project in material, design, and extent.
- E. Manufacturer Qualifications: Firms whose equipment, specialties, and accessories are listed by product name and manufacturer in UL's "Fire Protection Equipment Directory" and FM's "Fire Protection Approval Guide" and that comply with other requirements indicated.
- F. Contractor Qualifications: Fire protection system work shall be supervised and performed by personnel regularly engaged in the installation of fire protection systems per Underwriter's and NFPA Standards.
 - 1. Where allowed, employ for welding, brazing, soldering and cutting work, "qualified" personnel, as defined by applicable code and certified by the National Weld Test Bureau, the Hartford Steam Boiler and Inspection Company, or other approved bureau or agency.
- G. Standpipe and Sprinkler Components: Listing/approval stamp, label, or other marking by a testing agency acceptable to authorities having jurisdiction.
- H. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- I. NFPA Standards: Equipment, specialties, accessories, installation, and testing complying with the following:
 - 1. NFPA 10, "Portable Fire Extinguishers."
 - 2. NFPA 13, "Installation of Sprinkler Systems."
 - 3. NFPA 14, "Standpipe and Hose Systems."
- J. Hydraulic Design Criteria: Design sprinkler piping according to the following and obtain approval from authorities having jurisdiction:
 - 1. Base design on hydraulic calculations.
 - 2. Include hose stream allowance. Add two hose streams at their point of connection to the overhead sprinkler system, 50 gpm each, and 150 gpm at the base of the automatic sprinkler riser.
 - 3. Include losses through water-service piping, valves, and backflow preventers.
 - 4. Use 165 deg F rated heads on all sprinkler systems, except in areas where the ambient temperature exceeds 110 deg F. Sprinkler ratings for areas exceeding 110 deg F shall be ambient plus 50 deg F.
- K. Piping, Components, and Installation: Capable of producing piping systems with 175-psig minimum working-pressure rating, unless otherwise indicated.

1.4 SUBMITTALS

- A. Furnish submittals for items that are identified in this SECTION by a different typeface and a bracketed code (e.g., *Item [L]*). Refer to DIVISION 1 SECTION for definition of codes for

types of submittals and the administrative requirements governing submittal procedure. Additional submittal requirements pertaining to this SECTION are specified herein under this Article.

B. Working plans:

1. Working plans shall be submitted for approval to the authority having jurisdiction before any equipment is installed or remodeled. Deviation from approved plans shall require permission of the authority having jurisdiction.
2. Working plans shall be drawn to an indicated scale, on sheets of uniform size, with a plan of each floor, and shall show items from the following list that pertain to the design of the system.
3. Where the equipment is to be installed as an addition to an existing system, indicate enough of the existing system on the plans to make all conditions clear.
4. The working plan submittal shall include the manufacturer's installation instructions for any specially listed equipment, including descriptions, applications, and limitations for any sprinklers, services, piping, or fittings.
 - a. OWNER'S name, street address, city, and state.
 - b. The bay/column location and building number where the installation is proposed.
 - c. The scale used on all plans.
 - d. Name and address of contractor.
 - e. Full height cross section (scaled), or schematic diagram, including details of structural member and ceiling construction. Indicate the type of construction (obstructed or unobstructed) per the definitions in NFPA 13.
 - f. Details of lights, HVAC ducts, and other non-structural obstructions to the proposed sprinklers.
 - g. Locations of full height walls.
 - h. Occupancy class of each room/area.
 - i. Location and size of concealed spaces. Include construction and occupancy details.
 - j. Any small enclosures/areas where no sprinklers are omitted.
 - k. Make, type, model, and nominal K-factor of sprinklers and manufacturers cut sheet(s).
 - l. Temperature rating and location of all sprinklers.
 - m. Total area protected by each system riser on each floor.
 - n. Pipe type and schedule of wall thickness.
 - o. Nominal pipe size and cutting lengths of pipe (or center-to-center dimensions). Where typical branch lines prevail, it shall be necessary to size only one typical line.
 - p. Location and size of riser nipples.
 - q. Type of fittings and joints. Location of all welds and bends. The contractor shall specify on drawing any sections to be shop welded and the type of fittings or formations to be used.
 - r. Type and location of hangers, sleeves, braces, and methods of securing sprinklers.
 - s. Make, type, model, and size of all control valves, alarm valves, dry pipe valves, preaction valves, deluge valves, check valves, etc. Also include size of drain pipes, and test connections.
 - t. Size and location of risers, hose outlets, and related equipment.
 - u. For hydraulically designed systems, provide hydraulic data nameplate.

- v. Show hydraulic reference points on the plan that correspond with comparable reference points on the detailed hydraulic calculation sheets.
 - w. Detailed Hydraulic Calculation Forms per section 8-3 of NFPA 13. Also include the minimum rate of water application (density), the design area of water application, in-rack sprinkler demand, and the water required for hose streams both inside and outside calculated to the Base of Riser and back to the available water supplies. Elevations Above Finished Floor of sprinklers, junction points and supply or reference points should be included.
 - x. The location and proof of the hydraulically most remote area (using the rectangular area having a dimension parallel to the branch lines equal to or greater than 1.4 times the square root of the area of operation).
 - y. Calculation of loads for sizing and details of sway bracing for Earthquake prone areas.
- C. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13 and NFPA 14. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."
- D. Maintenance Data and Hydraulic Placard: For each sprinkler system to include in maintenance manuals specified in Division 1.

1.5 RECORD DOCUMENTS

- A. Submit as-built drawings and progress prints per DIVISION 1 SECTION.

1.6 OPERATION AND MAINTENANCE DATA

- A. Furnish per DIVISION 1 SECTION, operating and maintenance data, special tools, and spare parts list.
- B. Include permanent type hydraulic placards, nameplates and instruction plates to identify the system and instruct in its use under emergency conditions.
- C. Spares for each type of sprinkler head complete with cabinet and wrench per NFPA No. 13.

1.7 PROJECT CONDITIONS

- A. Hazardous Areas
- 1. Ground piping and equipment in hazardous areas as specified in the DIVISION 16 SECTION.
 - 2. Provide electrically operated equipment suitable for NEC 500 Class I, Division I, Group D Series.

PART 2 PRODUCTS

2.1 ABOVEGROUND PIPING MATERIALS

A. Type BCS-FP (STD.), Black Carbon Steel -Fire Protection

1. Pipe:
8 and under Schedule 40 black carbon steel; ASTM A 53, Type E
2. Pipe:
10 and larger Schedule 30 black carbon steel; ASTM A 53, Type E or S, Grade B.
3. Couplings:
All sizes Extra heavy screwed black carbon steel ASTM A-53.
4. Unions:
1/8 thru 2 300 PSI WSP female screwed malleable iron with ground joint and brass to iron seat.
5. Nipples:
1/8 thru 2 Schedule 80 black carbon steel, ASTM A 53.
6. Flanges:
2-1/2 and up 175 PSI WOG minimum, cast iron screwed; ASTM A 126, Class B and ANSI B16.1, UL/FM Listed.
7. Fittings:
175 PSI WOG minimum, cast iron screwed; ASTM A 126, Class B and ANSI B16.4 or flanged; ANSI B16.1, UL/FM Listed.
8. Cut and roll grooved couplings and fittings:
All sizes UL/FM Listed, malleable iron, elastomer gasket.
 - a. Anvil International
 - b. Victaulic
9. Welding fittings:
4 and up Steel butt weld; ASTM A 234 and ANSI B16.9 to match pipe wall thickness.
10. Flanges:
2-1/2 and up 150 PSI WSP steel; ANSI B16.5 and ASTM A 181, Grade 1 or 2 to match pipe wall thickness.

2.2 PIPING SPECIALTIES

A. Backflow Preventer

1. *Reduced pressure backflow-prevention device [D]*: UL Listed reduced-pressure-type per AWWA C-506, New York State approved for toxic chemicals.
 - a. Hersey Products Inc. - AERGAP BEECO Model 6 CM.
 - b. Cla-Val Co. "RP Series".
 - c. Febco Model 825.

2.3 ABOVEGROUND VALVES

A. General

1. Refer to NFPA 13.
2. Use UL Listed/FM Listed valves.
3. For overhead, inaccessible, exposed valves, equip with chain wheel and chains of sufficient length to allow operation from the floor.
4. Valves shall be locked open with chains and locks. Locks to be keyed alike to match site requirements.

B. Description

1. Ball valves: 2 inches and under.
 - a. Jamesbury "Type A-11-TT-22".
 - b. Rockwood "Style M101".
 - c. Worcester "Style 44".
 - d. Grinnell
2. Gate valves: 2 inches and under.
 - a. Crane "No. 459".
 - b. Stockham "B-133".
 - c. Kennedy Valve Div. of MCWANE Inc.
 - d. NIBCO "T-104-0".
 - e. Grinnell "No. 66".
3. Globe valves: 2 inches and under.
 - a. Crane "No. 7".
 - b. Stockham "B-22".
 - c. Grinnell "No. 3240"
4. Check valves: 2 inches and under.
 - a. Crane "No. 34".
 - b. Stockham "B-319".
 - c. Grinnell "No. 3310".
5. Gate valves: 2-1/2 inches and larger.
 - a. Crane "No. 467".
 - b. Stockham "G-634".
 - c. Kennedy Valve Div. of MCWANE Inc.
 - d. NIBCO "T-104-0".
 - e. Mueller, Div. of Grinnell "No. A2079-6".
6. Check valves: Rubber faced checks 2-1/2 inches and larger.
 - a. Crane No. 375.
 - b. Stockham "No. G-940".
 - c. Kennedy Valve Div. of MCWANE Inc. No. 126A.
 - d. NIBCO No. F-908-W.
 - e. Mueller, Div. of Grinnell No. A2122-6

2.4 SPRINKLER SYSTEM COMPONENTS

A. Sprinkler Heads

1. *Upright or pendent type [P]:* In all unfinished areas; as required.
 - a. Star Sprinkler, Tyco Fire Products, Model SG.
 - b. Grinnell, Tyco Fire Products, Model "A".
 - c. Reliable Model F1.
 - d. Viking Micromatic Model M
 - e. Central, Tyco Fire Products, Model GB Series.
2. Pendent type, chrome plated brass heads: In finished areas below suspended ceilings. Furnish escutcheon plate with baked enamel finish to match ceiling.
 - a. Grinnell, Tyco Fire Products, "Model F972".
 - b. Viking Micromatic Model M/Model E-1 Escutcheon.
 - c. Star Sprinkler, Tyco Fire Products, Model SG
 - d. Reliable Model F1.
 - e. Central, Tyco Fire Products, Model GB Series.
3. Temperature rating of heads shall be ordinary temperature, 155 to 165 degF temperature ratings except shall be 50 degF above ambient for temperatures exceeding 100 degF.
4. Sprinkler head guards: Furnish where damage to sprinkler heads may occur, such as stairways, loading docks or aisles with lift truck operations.

B. Pressure Gauges (Water)

1. Bronze Bourdon tube: 0-200 PSI range, 3-1/2 inch dial.
 - a. Ashcroft Duragauge Model 1005, XUL.
 - b. Brecco Corp. Model W-101.
 - c. US Gauge Div. Amtek Inc. P-1590.

C. Sprinkler System Control Valves

1. Wet pipe alarm check valve: Flanged or grooved end inlet and outlet complete with standard accessories and trim including pressure gages, necessary intercomponent piping, fittings and valves.
 - a. Grinnell, Tyco Fire Products, Model F200 (Flanged) or F2001 (Flange x Groove) or F20 (Groove x Groove).
 - b. Star Sprinkler, Tyco Fire Products, Model E 5900 Series.
 - c. Viking Corp. Model H-2.
 - d. Reliable Model E.
 - e. Central, Tyco Fire Products, Model F.

2.5 ALARM DEVICES

- ### A. Flow Alarm, Vane type: With 2 SPDT contacts which will energize alarm circuit on deflection by flowing water that equals or exceeds the capacity of a single sprinkler head.
1. Central Sprinkler, Tyco Fire Products, Model VSR-F.
 2. Grinnell, Tyco Fire Products, Model VSR-F.
 3. Potter Electric Signal Co. Model VSR-F.
 4. Reliable Model A.

5. Viking Corp. Model VSR-F.
- B. Valve supervisory switch: Unit shall contain one or two single pole, double throw switches, mounting hardware, and accessories necessary to monitor unauthorized closing of water supply to automatic sprinkler system, by actuating a remote signaling device when the water supply valve is turned from the full open position.
1. Central Sprinkler, Tyco Fire Products.
 2. Grinnell, Tyco Fire Products, Model OSYSU-A2.
 3. Guardian Fire Equip. Co. Model No. 7247.
 4. Potter Electric Signal Co. Model OSYSU-A2.
 5. Potter Roemer Figure 6220.
- C. Electric alarm gong: Assembly shall include an U.L. Listed gong with non-staining, weather resistant mounting. Wiring will be provided as part of WORK under DIVISION 16 SECTIONS.
1. Grinnell, Tyco Fire Products, Model PBA-AC or PBD-DC
 2. Guardian Fire Equip. Co. Model No. 7276.
 3. Potter Electric Signal Co. Model PSB.
 4. Star Sprinkler, Tyco Fire Products.

2.6 FIRE HOSE VALVE

- A. Siamese Wall Exposed Type: Cast brass, wall mounted, “Y” type with rough finish, two 2-1/2 inch fire department inlets, double clapper check valves, lug caps and chains and cast-in function lettering. Hose connections shall be compatible with local fire department connections.
1. Manufacturer:
 - a. Badger Powhatan Model No. 21-203.
 - b. Croker Div. Fire End and Croker Corp. 6430.
 - c. Elkhart Brass Mfg. Co. Inc. No. 156.
 - d. Guardian Fire Equipment Co. Model 203.
 - e. Potter-Roemer Model 5750.
- B. Hose Valve: 2 1/2” Angle type, male outlet connection cast brass valve with red hand wheel, with 1 1/2” hose adapter with cap and chain.
1. Badger Powhatan Model No. 18.157.
 2. Croker Div. Fire End and Croker Corp. 5015.
 3. Guardian Fire Equipment Co. Model 157-U.
 4. Potter-Roemer Model 4065.

2.7 PORTABLE FIRE EXTINGUISHERS (FE-1)

- A. Portable Fire Extinguishers (FE-1)
1. *Pressurized ABC multi-purpose dry chemical [P]*: Red enamel steel tank, 10 pound capacity, ammonium phosphate base, with self-closing hand valve, discharge hose, pressure gauge, and wall mounting bracket where indicated. UL rating 4A:60 B:C for Class A, B, and C fires.
 - a. Amerex Model 441.

- B. Portable Fire Extinguishers (FE-2)
- C. *Pressurized CO₂ [P]*: Red enamel steel tank, 15 pound capacity, with self-closing hand valve, discharge hose, pressure gauge, and wall mounting bracket where indicated. UL rating 10 B:C for Class B, and C fires.
 - 1. Amerex Model 331.

2.8 ELECTRICAL WIRING

- A. Electrical wiring: Install or reconnect load side wiring disconnected for shipment; for replacement or additional wiring required, provide as part of the WORK of this SECTION per applicable requirements of DIVISION 16 SECTIONS.

2.9 SUPPORTING ELEMENTS

- A. Supporting elements: Provide UL/FM components per NFPA 13, ANSI B 31.1 and MSS SP-58 and SP-69 except that “C” clamps or any modification thereof are unacceptable.
- B. Furnish necessary piping and equipment supporting elements including; building structure attachments; supplementary steel; hanger rods, stanchions and fixtures; vertical pipe attachments; horizontal pipe attachments; anchors; guides.
- C. All hanger rods shall connect to approved “I” beam or channel clamps, concrete inserts or expansion shields. Provide all concrete inserts and structural members required for the proper support of fire protection piping. “C” clamps with or without retainer straps may not be used on piping 3” and larger. Top C-clamps with retaining straps (as specified) may be used on pipe sizes up to and including 2-1/2” nominal diameter; install lock nut on hanger rod above retaining strap.
- D. “C” clamps without retaining straps are not permitted.

<u>Pipe Size</u>	<u>Manufacturer</u>	<u>Model No.</u>
<u>Clevis Hangers</u>		
Up to & incl. 4” diameter	Anvil International	65
Up to & incl. 8” diameter	Anvil International	260
		B-Line B3100
		M-Co. 400
		Witch 100
<u>Adjustable Swivel Rings</u>		
Up to & incl. 8” diameter	Anvil International	69
		B-Line B317ONF
		M-Co. 100
		Witch 800

Beam Clamps

Up to & incl. 8" diameter	Anvil International	218 with extension piece No. 157 B-Line B3054
Up to & incl. 12" diameter	Anvil International	134 B-Line B3050

Top C-Clamps with Retaining Straps

Up to & incl. 2-1/2" diameter	Anvil International	92 or 93 with retaining strap equal to or greater than B-Line B3367. B3033 or B3034 with B3367.
	B-Line	
Up to & incl. 2-1/2" diameter	M-Co.	300 or 310 with 301 retaining strap. Witch 192 with retaining strap. Persing 35, 36 or 37
with		1/8" thick # 35RS retaining strap.

1. Hangers for overhead piping shall comply with NFPA 13 Standard as to size, load capacity and spacing. Special supports and hangers shall meet with the approval of the OWNER'S REPRESENTATIVES.
2. Suspension from roof deck will not be permitted.
3. Vertical piping supports within the column web shall consist of a strut with mechanical type fastening to the column flanges, and pipe clamp attached to the strut. Pipe clamps shall be U.L. labeled, FM approved. Minimum strut section modulus shall be equal to or greater than that listed in NFPA 13 for trapeze hangers.
 - a. Pipe clamp shall be B-Line Systems, Inc. B2400 Series or equal by Grinnell.
 - b. Strut column support shall be B-Line Systems, Inc. Model No. B613A or equal by Grinnell.

2.10 MISCELLANEOUS MATERIALS

- A. Painting:
 - 1. Refer to DIVISION 9 SECTION for requirements.
- B. System Identification:
 - 1. Refer to DIVISION 15 SECTION for requirements.
- C. *Fireproof Wall and Floor Sleeves [P]*:
 - 1. Aboveground sleeves:
 - a. Provide standard weight black carbon steel pipe sleeves where piping passes through roofs, floors and concrete or masonry walls. Location of sleeves shall be coordinated with other DIVISIONS for incorporation into the WORK as construction progresses.
 - b. Provide cast-in-place sleeves, fabricated from pipe with welded anchor lugs.
 - c. Sleeves through steel decks shall be welded with a continuous weld to the deck.
 - d. Where sleeves are placed in existing concrete or masonry, use pipe size core drills and secure sleeve watertight with EPOXY BONDING COMPOUND. Do not load sleeves without approval of OWNER'S REPRESENTATIVE.
 - e. Set sleeves flush with walls, under sides of suspended slabs and top surface of floors in finished spaces. Set sleeves flush with walls and 2 inches above finished floor in manufacturing and equipment room spaces, unless otherwise indicated. Set sleeves a minimum of 9 inches and a maximum of 12 inches above finished roof.
 - f. Refer to DIVISION 7 SECTION for requirements, packing and sealing of space between the piping and the inside of sleeve.
 - 2. Below grade sleeves:
 - a. Provide below grade wall sleeve and modular floor and wall seal to assure protection against the penetration of flames, smoke, gases, and water for three hours.
 - b. Sleeve shall be manufactured from heavy wall welded or seamless steel pipe with full circle, continuously welded water stop plate, to assure positive water sealing on the O.D. of the sleeve and no thrust movement. Sleeve shall be finished with enriched red primer to assure metal surface protection.
 - 1) Thunderline "Link-Seal" Wall Sleeves.
 - c. Modular floor and wall seal shall be constructed of inorganic materials to provide protection against the penetration of flames, smoke, gases, water and temperatures in excess of 1900 degF for three hours. Sealing elements shall be fire resistant silicone rubber with steel pressure plates and shall meet ASTM Standard E-119-76.
 - 1) Thunderline "Link-Seal, Pyro-Pac".
- D. Escutcheons:
 - 1. Nonferrous, chrome plated, except if fabricated from AISI 300 Series Stainless Steel, one-piece or split pattern type shall maintain fixed position against a surface by internal spring tension or set screws.
- E. Flashing: Refer to DIVISION 7 SECTION for requirements.
- F. Epoxy Bonding Compound: Refer to DIVISION 7 SECTION for requirements.

- G. *Bituminous Coating [P]*: Refer to DIVISION 7 SECTION for requirements.
- H. Splash Blocks:
 - 1. Precast concrete splash blocks.

PART 3 EXECUTION

3.1 ABOVEGROUND PIPING INSTALLATION

- A. Fabrication, Assembly, Erection
 - 1. Install piping per NFPA 13, OWNER'S Underwriters and governmental authorities having jurisdiction.
 - 2. Clean pipe, tubing, fittings, valves, equipment and accessories of extraneous foreign material and dry the components before installation into their respective systems. During construction, protect open ends of pipe, fittings and valves to prevent the admission of foreign matter. Place plugs in the ends of installed work at the end of the day and whenever work stops. Use commercially manufactured plugs. Fabricate pipe to measurements established on the project site; work pipe into place without springing or forcing. Provide for absorbing movement without undue stress in any part of the system.
 - 3. Install piping straight and true, with approved offsets to increase headroom and avoid obstructions. Provide specified drainage and venting where piping offsets are required.
 - 4. Use standard pipe fittings for changes in direction. No mitered joints or field fabricated pipe bends will be permitted. Short radius elbows may be used where specified or specifically authorized by the OWNER'S REPRESENTATIVE. Copper tubing may be bent in the field with the use of approved tube bending equipment.
 - 5. Make tee connections with screwed tee fittings or specified welded connections. Make welded branch connections with either welding tees or forged branch outlet fittings per ASTM A 234, ANSI B16.9 and ANSI B16.11. For forged branch outlets, furnish forged fittings flared for improved flow where attached to the run, reinforced against external strains and to full pipe-bursting strength requirements. "Fishmouth connections" are not acceptable.
 - 6. Provide unions, grooved couplings, or bolted flanges to permit removal of equipment, valves and piping accessories from the piping system. Make final connections to equipment with unions or flanges located between equipment and valves.
- B. Joints
 - 1. Ream pipe ends. Make up screwed joints with joint compound. Apply joint compound to the male thread only; prevent compound from reaching the interior of the pipe. Provide leak-tight joints without stressing fittings.
 - 2. Make up screwed joints with Teflon tape per manufacturer's instructions.
 - 3. Hot work permit shall be approved by the site Security before any hot work is started. Perform field welding and cutting in approved areas per referenced codes and standards. Provide welded joints utilizing chill rings in black carbon steel piping systems sized 2-1/2 inch and larger, except where consumable insert rings, flanges and unions are specified or

indicated. The CONTRACTOR may use socket or butt welded joints in lieu of screwed joints, sizes 2 inches and under.

4. Assemble flanged joints with fresh-stock gasket and hex head nuts, bolts or studs. Make clearance between flange faces such that the connections can be gasketed and bolted tight without strain on the piping system. Align flange faces parallel and bores concentric; center gaskets on the flange faces without projection into the bore.
5. Lubricate bolts with oil and graphite before assembly to insure uniform bolt stressing. Draw up and tighten bolts in staggered sequence to prevent unequal gasket compression and deformation of the flanges. Do not mate a flange with a raised face to a companion flange with a flat face; machine the raised face down to a smooth matching surface and use a standard ring gasket. After the piping system has been tested and is in service at its maximum temperature, check bolting torque to provide required gasket stress.
6. Silicone components are not allowed.

C. Joints Of Dissimilar Metals

1. At connections between piping systems, hangers and equipment of dissimilar metals, insulate, using dielectric insulating material, nonferrous piping against direct contact with the building steel by insulating the contact point of the hanger and pipe or the hanger and building steel. Test each point of dielectric insulation with an ohmmeter to insure proper isolation of dissimilar materials. Test shall be observed by the OWNER'S REPRESENTATIVE.

D. Grooved Couplings And Fittings

1. Grooved pipe couplings and fittings shall be as specified and indicated. Select manufacturer's recommended gaskets for the piping contents.

3.2 SPRINKLER HEADS

- A. Space heads per lighting, building equipment layout and NFPA 13. Because the sprinkler heads may be installed before the lighting, ducts, piping and equipment are installed, locate heads referring to CONTRACT DRAWINGS to prevent conflicts. Equipment location shall have priority over sprinkler head and piping location. No sprinkler pipe shall pass through air ducts.
- B. Aesthetically locate sprinkler heads in finished administrative function spaces with respect to ceiling patterns, tile patterns, masonry bonds and similar construction lines. Locate sprinklers on center of tile or quarter point of ceiling tile.
- C. Upon completion of installation and prior to any painting work, protect heads with rubber band secured plastic or paper bags. Removal of bags is specified as part of work of Division 09 Section "PAINTING."

3.3 BUILDING SURFACE PENETRATION SLEEVES AND CALKING

- A. Sleeves are required where piping passes through roofs, floors and concrete or masonry walls. Provide sleeves required for this WORK in cooperation with the work provided under other DIVISIONS for incorporation into the WORK as construction progresses.

- B. Provide cast-in-place sleeves, fabricated from pipe with welded anchor lugs.
- C. Sleeves through steel decks shall be welded with a continuous weld to the deck.
- D. Where sleeves are placed in existing concrete or masonry, use pipe size core drills and secure sleeves watertight with EPOXY BONDING COMPOUND. Do not load sleeves without approval of OWNER'S REPRESENTATIVE.
- E. Set sleeves flush with walls, under sides of suspended slabs and top surface of floors in finished spaces. Set sleeves flush with walls and 2 inches above finished floor in manufacturing and equipment room spaces, unless otherwise indicated. Set sleeves a minimum of 9 inches and a maximum of 12 inches above finished roof.
- F. Pack space between bare or insulated pipe and the inside of sleeve with mineral wool or fibrous glass. Where vapor barrier is required, add 3/8 inch deep calking on both sides of packing.
- G. Seal piping passing through aboveground sleeves weathertight with packing and calking. Calk expandable inserts exposed to weather.
- H. With OWNER'S REPRESENTATIVE'S approval, silicone foam may be used in lieu of the foregoing for interior applications.

3.4 ESCUTCHEONS

- A. Provide escutcheons at all surface penetrations of piping into finished areas. Where finished areas are separated by partitions through which the piping passes, provide escutcheons on both sides of the partition. Where suspended ceilings are installed, provide escutcheons at the underside only.

3.5 FLASHING AND COUNTERFLASHING

- A. Provide flashing and counterflashing to maintain building weathertightness.

3.6 PAINTING

- A. Refer to DIVISION 9 SECTION "Painting."

3.7 SYSTEM IDENTIFICATION

- A. Refer to DIVISION 15 SECTION "General Mechanical Requirements."

3.8 FIELD QUALITY CONTROL

- A. General
 - 1. Test equipment per the manufacturer's published instructions, NFPA and as specified for the system.

- B. Piping Systems Testing
 - 1. Test piping systems per NFPA 13 and 14, applicable governing codes, such as State, local or insurance codes, and the requirements of OWNER'S insuring agency.
 - 2. Provide the necessary equipment and materials and make necessary test connections required to properly execute tests. Tests shall be witnessed by OWNER'S REPRESENTATIVE and authorized inspectors (or representatives) having jurisdiction, who shall be timely notified by the CONTRACTOR to insure their being present during the testing.
 - 3. Perform tests before piping is painted or concealed. Immediately correct defects discovered during the tests and retest the systems to the complete satisfaction of the OWNER'S REPRESENTATIVE and the inspectors (or representatives) authorized to approve the piping installation. Correct any piping system, or any portion thereof, which does not conform to the best current installation practices of the trade. Such corrections shall be at no additional cost to the OWNER.

3.9 FLUSHING AND DISINFECTING

- A. Disinfect piping if required to comply with applicable codes.
- B. Flush piping per NFPA 13 at a velocity of not less than 10 FPS.
- C. Provide additional system controlled or uncontrolled openings necessary to achieve specified velocity.
- D. If sufficiently high velocities cannot be practically obtained, "lance" piping prior to flushing with high pressure water or oil-free compressed air jets.
- E. Submit for approval proposed means of disposing of flushing water.

3.10 COMMISSIONING

- A. Verify that specialty valves, trim, fittings, controls, and accessories are installed and operate correctly.
- B. Verify that specified tests of piping are complete.
- C. Verify that damaged sprinklers and sprinklers with paint or coating not specified are replaced with new, correct type.
- D. Verify that sprinklers are correct types, have correct finishes and temperature ratings, and have guards as required for each application.
- E. Verify that potable-water supplies have correct types of backflow preventers.
- F. Verify that hose connections and fire department connections have threads compatible with local fire department equipment.

- G. Fill wet-pipe sprinkler piping with water.
- H. Energize circuits to electrical equipment and devices.
- I. Adjust operating controls and pressure settings.
- J. Coordinate with fire alarm tests. Operate as required.

3.11 DEMONSTRATION

- A. Demonstrate equipment, specialties, and accessories. Review operating and maintenance information.
- B. Schedule demonstration with OWNER, OWNERS Underwriter, and authorities having jurisdiction with at least seven days' advance notice.

END OF SECTION

Revision History	
Date	Rev. No.
A	0
B	0
C	0
D	0
E	0
F	0
02-19-09	0

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